Media Access Group at WGBH
Boston • Los Angeles • New York

October 2, 2003

Ms. Marlene Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20544

Re: *Ex Parte* Presentation, MB Docket No. 03-15; RM 9832. Second Periodic Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television; MM Docket No. 99-360: Public Interest Obligations of TV Broadcast Licensees; MM Docket No. 00-168: Standardized and Enhanced Disclosure Requirements for Television Broadcast Licensee Public Interest Obligations.

Dear Ms Dortch:

On Wednesday, October 1, 2003, Larry Goldberg, Director of the Media Access Group at WGBH and Gerry Field, DTV Access Project Manager, CPB/WGBH National Center for Accesible Media (NCAM) met by telephone conference call with Rick Chessen (Associate Bureau Chief, Media Bureau, Digital Television Task Force), Bill Johnson (Deputy Bureau Chief, Media Bureau), Eloise Gore (Assistant Division Chief, Policy Division, Media Bureau), Walid Kassem, Sonia Mickle, and Peter Corea of the Media Bureau staff, Neal McNeil (OET/TRB) and Tom Chandler (CGB/DRO) on matters related to the above-referenced proceedings.

Specifically, Mr Goldberg and Mr. Field reviewed NCAM's comments filed on April 21, 2003 in the Second Periodic Review of DTV Rules requesting that the Commission formally adopt the ATSC Program and System Information Protocol (A/65B) standard and require its use by broadcasters, multiple video program distributors (MVPDs) and consumer receiving equipment, and seeking clarification of certain issues relating to the Commission's digital closed captioning rules

Mr. Goldberg and Mr. Field also reported that, based on NCAM's experience in the field, many DTV broadcasters are not providing captioning in

full or at all. Of nine DTV stations in the Boston area market, only three provide both DTVCC and NTSC captions, three provide only NTSC captions, and three provide no closed captioning at all. Other observations from additional markets around the country indicate that only 10 of 51 DTV stations provide both DTVCC and NTSC captions. NCAM feels this is largely due to misunderstanding of the current FCC rules and requirements by broadcasters and equipment vendors, and clearly indicates the need for clarification of the rules.

NCAM asks the Commission to clarify that the digital closed captioning rules: 1.) apply to all digital television transmissions (whether Standard Definition or High Definition), 2) apply equally to each sub-channel in the case of multicasting, 3.) do not grant any automatic exemption to any channel based on revenue, 4.) require that DTVCC caption data must always be included so as to enable the advanced caption display features required in DTV receiving devices by the Commission's rules, and 5.) require that NTSC caption data must always be included to provide suitable caption data for related downstream NTSC devices (such as VCRs),

In response to staff questions, Mr. Goldberg and Mr. Field provided information on the availability of DTV closed caption encoders, transcoders and related equipment. These devices first came on the market in 1998, and are now available through multiple vendors, at generally lower costs. Further information was included in the NCAM DTV Access Brief entitled "Delivering Captions in DTV", which we included in our April 21, 2003 comments. We have attached a copy of this filing to this letter

Finally, Mr. Field distributed a powerpoint presentation originally presented at the National Association of Broadcasters' convention in April of this year. Entitled "Making It All Work: Captioning, Audio Services and PSIP", this presents an overview of how PSIP information is essential in delivering closed captioning, video description and second language services in DTV systems. A copy of this presentation is attached to this letter as well.

Sincerely,

Gerry Field

Gerry Field, Manager
DTV Access Project
CPB/WGBH National Center for Accessible Media (NCAM)

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
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Second Periodic Review of the	)	
Commission's Rules and Policies	)	**MB Docket No. 03-15**
Affecting the Conversion	)	**RM 9832**
To Digital Television	)	
	)	
Public Interest Obligations of	)	**MM Docket No. 99-360**
TV Broadcast Licensees	)	
	)	
Children's Television Obligations of	)	**MM Docket No. 00-167**
Digital Television Broadcasters	)	
	)	
Standardized and Enhanced Disclosure	)	**MM Docket No. 00-168**
Requirements for Television Broadcast	)	
Licensee Public Interest Obligations	)	

COMMENTS OF THE
CPB/WGBH NATIONAL CENTER FOR ACCESSIBLE MEDIA
(NCAM)
April 21, 2003

Submitted By:
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The CPB/WGBH National Center for Accessible Media (NCAM)[1] hereby submits these comments on the Commission's Notice of Proposed Rule Making in the proceeding noted above concerning the Commission's review of its rules and policies affecting the conversion to digital television (DTV) in the United States. In addition, NCAM is referencing and re-affirming its

[1] NCAM is the research and development arm of the Media Access Group at WGBH. Since 1971, WGBH has been a pioneer in making media accessible to people with disabilities through The Caption Center and the Descriptive Video Service®. NCAM was founded in 1993 to build on WGBH's knowledge base in the field of access technologies. NCAM's DTV Access Project has supported development and implementation of digital television accessibility since 1998.

previously-filed comments on the related proceedings noted above concerning various public interest obligations of television broadcasters[2].

Background

NCAM's DTV Access Project has been closely involved in the development and implementation of digital television standards since 1998, following other WGBH efforts to support closed captioning and video description services going back three decades. Through the DTV Access Project, NCAM is an active participant in and contributor to related activities of the Advanced Television Systems Committee (ATSC), the Consumer Electronics Association (CEA), the Society of Motion Picture and Television Engineers (SMPTE), and the Society of Cable Telecommunications Engineers (SCTE). NCAM staff regularly present at major industry and consumer conferences, and are seen as leading experts in the field of television accessibility.

Clarifications Needed

On July 1, 2002, the Commission's rules regarding DTV Closed Captioning decoder and programming requirements went into effect[3]. Based on our experience in digital television to date, we feel there is considerable confusion, differing interpretations, and misunderstanding concerning these rules and, as a result, there is very little captioning of digital television programming being provided by broadcasters today.

In an effort to assist broadcasters in responding to the new DTV caption requirements, NCAM wrote and presented a paper at the October 2002 SMPTE Technology Conference in Pasadena, CA[4]. "Delivering Captions in DTV" provides NCAM's considered analysis of what the rules require We are attaching a copy of this paper to these comments (See Page 9). However, we feel there remains a need for the Commission to provide guidance and clarification in this area.

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[2] See WGBH Comments, MM Docket No 99-360 (filed March 27, 2000), and MM Docket No. 00-168 (filed December 18, 2000)

[3] FCC 00-259 (Report and Order on DTV Closed Captioning Requirements, July 21, 2000), 47CFR§15 122 (Closed Caption Decoder Requirements for Digital Television Receivers and Converter Boxes), and 47CFR§79 1 (Closed Captioning of Video Programming).

[4] "Delivering Captions in DTV An NCAM DTV Access Brief", presented at the SMPTE Technology Conference, October 24, 2002 Available through the NCAM DTV Access Project website http //www dtvaccess org, and attached to these comments

NCAM respectfully suggests the Commission issue a Public Notice stating clearly and unambiguously what is required of broadcasters concerning delivery of DTV captioned programming, on these critical topics:

DTV Signals Must Include DTVCC Caption Data

Most broadcasters are not including DTVCC caption data[5] in their digital broadcast signals, and may only be providing the "NTSC compatibility bytes" intended for delivery to NTSC receivers and devices when a DTV receiver provides a downconverted signal. Many digital broadcasters are not providing any closed caption data at all.

Without DTVCC caption data, none of the advanced display features required by the Commission's rules are possible. In fact, many DTV receivers on the market today will only look for DTVCC caption data when tuning and displaying a digital broadcast signal.

DTVCC Caption Data Must Be Included In All Digital Broadcasts

There is a common misconception that FCC rules require DTVCC caption data only on High Definition broadcasts, and specifically exclude Standard Definition programs from carriage of DTVCC caption data. We feel the Commission should clarify that its rules apply to all digital television signals alike, and make no distinction between High Definition or Standard Definition programming in this regard.

NTSC Caption Data Must Be Included As Well

We feel the Report and Order and related rules make it very clear that the Commission rightly saw the need to support caption delivery to NTSC consumer devices during the DTV transition, and therefore required carriage of NTSC (also referred to as Line 21) caption data in digital television programming as a condition of counting this programming toward a provider's closed captioning requirements. However, we again feel this is a topic that needs clear re-statement and re-affirmation by the Commission.

[5] See references to EIA-708B within 47CFR§15 122, and related CEA/EIA and ATSC standards

"Per Channel" Requirements Need To Be Clarified

In digital television, a broadcaster may have more than one program stream carried in its licensed DTV frequency. The Commission should clarify that in the case of multicasting, each of the multiple program streams (each sub-channel) has a related caption requirement, following the model of the exisiting per—channel, per calendar quarter rules.

Revenue Exemptions Need Clarification

A substantial number of digital broadcasters and equipment vendors are of the opinion that DTV channels may be exempt from captioning requirements under the existing revenue exemption rules[6]. We would strongly disagree, and would counter that, particularly considering the Commission's overall digital television transition plan - including the temporary assignment of a second broadcast frequency and the analog/digital simulcast plan and requirements - that it was never the Commission's intent to apply these revenue exemptions automatically to DTV broadcast channels. We feel that the Commission has clearly stated the need to provide continued and uninterrupted caption services as the DTV transition proceeds. Again, we feel there is a strong and compelling need for the Commission to clarify this issue.

Other Issues

NCAM feels that the following issues concerning digital television and accessibility also need to be considered and addressed by the Commission:

Formal Adoption of PSIP

NCAM requests that the Commission formally adopt the Advanced Television Systems Committee's A/65B PSIP standard (Program and System Information Protocol), and require its use by broadcasters, MVPDs and consumer receivers alike.

In digital television, all services have two components· the data payload, and the service information. In such a complicated and complex system of channels, sub-channels, services

[6] See 47CFR79 1(d)(12)

and features, both components must be present, and only a clear and consistent method of naming, numbering and navigating these services can guarantee delivery from the provider to the consumer For the ATSC digital television broadcast standards adopted by the Commission, this method is ATSC PSIP.

In direct response to a question posed in this NPRM: yes, formal adoption of PSIP requirements by the Commission would substantially alleviate problems currently being experienced in the delivery of DTV closed captioning.

Specifically, if a digital broadcaster's signal is carrying the DTVCC closed caption payload but does not include the appropriate related PSIP data (the "caption service descriptor"[7]), there are many ATSC digital television receivers on the market today that will simply not be able to find the caption data or display them to the consumer. They will instead display an on-screen message saying "This feature is not available". Even though the data payload may be there, the receiver will not be able to find the caption service without the service information.

This caption service descriptor within the PSIP also provides detailed information about the multiple caption services that may be carried within a single digital television program, including language, reading level, aspect ratio and how many services in total are available. Without this PSIP information, the viewer is left uninformed and the receiver may not function properly or at all.

Another part of PSIP crucial to accessibility is the audio service information (the "AC-3 audio service descriptor"[8]). This provides the receiver and the viewer with critical information about the different audio services that may be available in a given program at a given time. Again, this includes language, whether the service is available in multichannel sound, and a specific tag that may indicate whether the service is intended for hearing impaired or visually impaired audiences

NCAM's experience to date has shown that without full and consistent use of PSIP from provider to consumer, if multiple audio services are included in the digital broadcast signal, the receiver may not be able to identify or deliver them to the consumer. Even if a digital broadcaster

[7] See ATSC Document A/65B (PSIP, March 18, 2003), Caption Service Descriptor, Section 6 9.3. Available at http //www atsc org

[8] See ATSC Document A/65B (PSIP, March 18, 2003), AC-3 Audio Service Descriptor, Section 6.9.1. Available at http //www atsc org

includes accurate PSIP audio service descriptor information, most receivers on the market today do not use this information, but instead look to simpler, less detailed information[9].

NCAM feels that only formal adoption by the Commission of the full A/65B PSIP standard, with clear requirements for its use from program providers and DTV receivers alike, will provide the consistency needed to deliver digital television services, including closed captioning and video description, effectively

Product Labeling

Beginning July 1, 2002, FCC rules have required virtually every newly manufactured digital television set and receiving device to include an advanced (EIA-708B) closed caption decoder[10]. These new decoders enable a number of advanced caption display features, including user-selectable font styles, sizes and colors. We are pleased to report that the consumer electronics industry has done a generally excellent job in meeting these requirements, and that many new DTV sets and receivers are available today with the new DTV caption decoders.

However, there is considerable confusion in the consumer marketplace concerning the availablility of the new decoders. For example, there are many DTV devices manufactured before July 1, 2002 that do not include the new decoders and cannot display the new caption features. Most new large-screen displays sold today may be labeled "HDTV ready", but since they do not have a built-in DTV receiver, they do not include the new caption decoders either. Even if a consumer is aware of the July 1, 2002 manufacturing requirements and rules, it may be difficult to impossible to be sure that any given item on a retail shelf includes the new decoder.

Consumers need to be provided with consistent and accurate information as to whether the new DTV device they are purchasing will be able to provide them the advanced features of the new caption decoders. We would request the Commission include in its product labeling and consumer awareness actions a clear labeling requirement to inform consumers whether a DTV device "includes an advanced (EIA-708B) closed caption decoder" or "requires an additional device to display advanced (EIA-708B) closed captions".

[9] See ATSC Document A/65 (PSIP, March 18, 2003), Service Location Descriptor, Section 6 9 6 Available at http //www atsc org

[10] See 47CFR15 122

Public Interest Obligations

The Media Access Group at WGBH has filed comment with the Commission on a number of occasions in prior proceedings concerning public interest obligations[11]. We have supported the recommendations of the President's Advisory Committee on the Public Interest Obligations of Digital Television Broadcasters, and we have made a number of other specific suggestions related to accessibility issues. We reference and re-affirm those comments with this filing.

Specifically, as reflected earlier in these comments, NCAM feels that "the requirements *incumbent upon* broadcasters today regarding closed captioning should also apply to each multicast channel provided by DTV broadcasters[12]".

We continue to be concerned with related and additional issues of accessibility, including availability of video description in DTV, preservation and set-aside of data space for closed captioning and video description, providing accessible user interfaces in consumer equipment and receivers, and accessible design of ancillary, supplementary and future data broadcasting services and devices. We also feel that web-based public inspection files must follow industry guidelines for accessible web site design[13].

In our comments filed in MM Docket No. 00-168, we suggested that standardized and enhanced disclosure requirements include specific information concerning availability of closed captioned and video described programming, and that this information be made available through accessible web sites and automated e-mail lists.

Conclusion

The Commission is involved in a number of initiatives to advance the DTV transition, and can advance related accessibility issues by:

1.) Clarifying the current DTV closed captioning rules.

2.) Adopting ATSC PSIP in full and requiring its use.

[11] See WGBH Comments, MM Docket No 99-360 (filed March 27, 2000), and MM Docket No. 00-168 (filed December 18, 2000)
[12] WGBH Comments, MM Docket No 99-360, March 27, 2000, Page 4.
[13] See WGBH Comments, MM Docket No 99-360 (March 27, 2000).

3.) Including accessibility in DTV product labeling.

4) Maintaining accessibility as a key element of public interest obligations.

NCAM and the Media Access Group at WGBH are pleased to be able to offer these comments, and to continue our involvement in the development and implementation of accessible digital television programs and services.

The CPB/WGBH

NCAM

National Center for Accessible Media

DELIVERING CAPTIONS IN DTV

An NCAM DTV Access Brief

October 2002

NOTICE The following information is offered by NCAM solely as a general overview of the current status of closed captioning support in digital television Features and capabilities of related systems and equipment vary widely Please consult your vendors to confirm specific product details for your installation.

There are two major issues engineers and managers need to be aware of concerning delivery of caption data in DTV broadcasts:

1.) You Need To Provide Both EIA-608 (NTSC) and EIA-708B (DTVCC) Caption Data

2.) You Need To Provide A "Caption Service Descriptor" in PSIP (PMT/EIT).

The Short Story - What You Need To Do

As of July 1, 2002, DTV programming must meet FCC rules for closed captioning and must include DTVCC caption data. To ensure continued support for existing NTSC consumer devices, DTV programming must also include NTSC caption data to be counted toward current captioned programming obligations

DTV receivers on the market prior to July 1, 2002 very likely do not have a 708 (DTVCC) caption decoder, since there were no FCC rules in effect at that time These devices may be decoding 608 (Line 21) caption data, if it is present in your signal.

Current FCC rules require all DTV receivers manufactured as of July 1, 2002 to include a 708 caption decoder These allow the viewer to control the caption display by selecting key 708 features such as different fonts, character sizes and colors

The new DTV caption decoders are expecting to see 708 (DTVCC) captions data in all of your DTV broadcasts, both SD and HD. It's likely they will ignore any 608 data in a DTV signal.

If you do not provide DTVCC caption data in your DTV broadcasts, you will not be providing captions to these devices.
Since 1998, technical solutions have existed to support DTV captioning at the local station by preserving caption services from existing captioned NTSC sources (your analog air, or tape library), and "data-bridging" from locked NTSC and HD sources.

Caption data server products from EEG, Evertz, Norpak, Ultech and others take existing Line 21 caption data and "translate" or "upconvert" them on the fly to provide both the 608 and 708 data you need. Clearly there are timing and latency issues here, and these caption encoders typically provide offset capability.

You should make sure that your current MPEG encoders (BOTH SD and HD) can accept 608/708 data and have the proper interface compatible with currently available caption servers.

If your MPEG encoder provides Line 21 data extraction as an on-board feature, you need to be sure it encodes the caption data in an ATSC compliant manner, and that it provides translation to 708 as well. Recent conversations with key manufacturers indicate this feature may now be coming to market, for both SD and HD product, likely as a software upgrade.

New DTV receivers are also expecting to see more PSIP data, including the "caption_service descriptors", in your signal.

Without a proper descriptor that identifies all available 708 caption services, the receiver's user interface may display "This feature currently not available" and ignore the captions even if there is 708 data present.

You should make sure your PSIP generation equipment can provide the caption_service descriptors according to ATSC A/65A. We recommend you place these in the PMT as well as the EIT, to accommodate the different requirements for the terrestrial and cable virtual channel tables (TVCT/CVCT)

The Background Details

The proper method of providing captions for ANY ATSC signal (SD or HD) is described in CEA/EIA-708-B and governed by 47 CFR 15.122.

In a compliant ATSC DTV transport, the DTV Closed Caption Transport Channel is a dedicated 9600bps (9 6k) in the user_data of a video elementary stream (per EIA-708-B and ATSC A/53B). This means that each program within a transport stream is allocated 9600bps.

It includes separate channels for NTSC (608) and DTVCC (708) caption data.

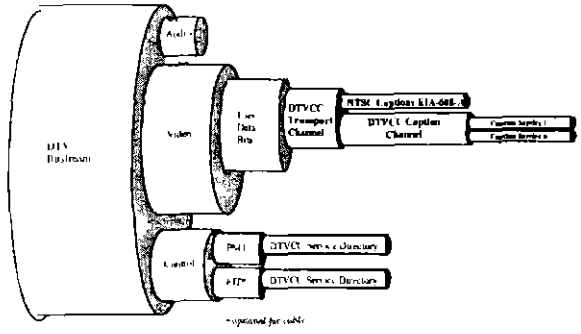


Figure 2. EIA/CEA-708B

NTSC Caption Data Channel

The purpose of the NTSC caption data channel is to provide a simple method to "tunnel" the much lower data rate Line-21 caption data (also referred to as "608 compatibility bytes") from existing NTSC sources to existing NTSC display devices and peripherals.

It is clearly described in EIA/CEA-708B, Sec. 4.3:

"The consideration for NTSC captioning (EIA-608-A) exists to facilitate the transcoding of the DTV video to NTSC video, and to preserve all line 21 data during the transcode process "

An additional CEA Engineering Bulletin (CEB-8) provides guidance on the use of Line 21 data within a DTV construct.

DTVCC Caption Data Channel

The purpose of the DTVCC (708) caption data channel is to provide a much higher data rate to the closed caption decoder in a DTV receiving device.

This enables the extended feature sets, services and viewer control over the display described in EIA-708-B, and defined and required by a related FCC Report and Order (FCC-00-259) adopted on July 21, 2000.

An additional CEA Engineering Bulletin (CEB-10) provides EIA-708-B implementation guidance for caption authors and decoder manufacturers.

Who Uses What?

As of July 1, 2002, the FCC requires all new DTV receiving devices to include a 708 caption decoder, defined by a Report and Order (FCC-00-259) adopted on July 21, 2000.

DTV receivers with caption decoders built to the new requirement very likely will look only for the DTVCC (708) caption data in a DTV broadcast, and ignore 608 data completely.

The FCC Report & Order describes this in detail in Paragraph 52, "Dual Mode Receivers". Dual-mode receivers are "devices that receive and display both analog and digital programming", either integrated receiver/displays or set-top boxes with multiple tuners.

The Report states:

"When operating in the digital mode, these receivers must display captions formatted pursuant to the rules we are adopting here "

Those rules, "Closed Caption Decoder Requirements for Digital Television Receivers and Converter Boxes" [47CFR§15.122], cannot be satisfied by 608 compatibility bytes in the NTSC Caption Data Channel.

While the NTSC Caption Data Channel remains a significant part of caption delivery, particularly through the transition, by providing caption data to downstream NTSC devices, it does not meet the full requirements for DTV.

DTV closed caption decoders require the use of data formatted according to FCC Rules Part 15.122, and carried in the DTVCC Caption Data Channel

You should note that the FCC rules go beyond the minimum receiver requirements of EIA-708-B, Section 9 and supercede those specifications.

DTV Captioned Programming Requirements

Under the DTV Captioning Report and Order, as of July 1, 2002 all programming published, exhibited or formatted for display on digital television receivers must be captioned under the existing FCC requirements and schedules.

The Report and Order set July 1, 2002 as the "new programming" date for captioned digital television programs, following the requirement of the current FCC captioning rules [47CFR§79.1(a)(6)(ii)]

The current captioned programming requirements call for a minimum number of hours on a per-channel, per-calendar-quarter basis, on a progressive schedule culminating on January 1, 2006, when virtually all programming must be captioned Certain exemptions do apply.

Current requirements (as of October 2002) amount to roughly 10 hours of captioned new programming per day, per channel.

"Pre-rule" programming - in the case of digital television, programming published, exhibited or formatted for display on digital television receivers prior to July 1, 2002 - follows a separate schedule with a 75% requirement by January 1, 2008. Existing "no-backsliding" rules also apply.

Importantly, the July 2000 Report and Order modified the Part 79.1(a)(4) (captioned programming) rules by striking the previous reference to the Part 15 119 (analog caption decoder) requirements.

Instead the rules now require programming to be captioned "in a format that can be recovered and displayed by decoders meeting the standards of Part 15 of this chapter"

By the current rules then, digital television programming must be delivered with captions that meet the Part 15.122 "Closed Caption Decoder Requirements for Digital Television Receivers and Converter Boxes" requirements.

Also importantly, the FCC stated in the DTV Captioning Report and Order, Paragraph 63

"We clarify, therefore, that in order for programming distributors to count captioned digital television programming toward their closed captioning requirements in 47 C.F.R Section 79.1, they also must transmit captions that can be decoded by the decoder in that analog set".

So current rules require both 608 and 708 caption data be present in digital television broadcasts to meet the current captioned programming obligations.

How Do I Put The Captions In There?

Using existing captioned NTSC sources (tape libraries, analog or 601 plant routing, analog air signals, caption files), you can use a number of methods to extract Line 21 caption data and provide both the 608 and 708 data you need.

Currently, most MPEG encoders provide Line 21 extraction ability. However, this only solves part of the problem, and some early models may use proprietary systems that are not ATSC compliant.

Very few MPEG encoders will provide both Line 21 extraction/embedding and 708 translation as a built-in feature.

As of October 2002, some MPEG encoder manufacturers have indicated they will be providing this as a feature in future product, and this bears watching Make sure to ask before you buy.

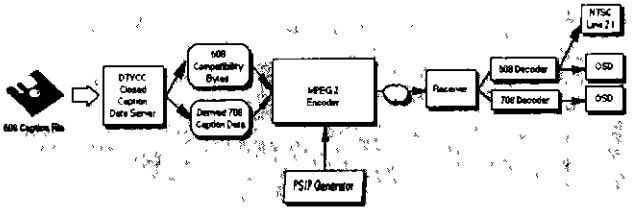
Helping Out The MPEG Encoder

In the meantime, you will probably have to use an external caption encoder. In all cases, make sure you're actually providing 608 and 708 data for both your SD and HD signals.

Caption encoding hardware from EEG, Evertz, Norpak, Ultech and other vendors can transcode and translate Line 21 data and hand it in the proper formats to an MPEG encoder for insertion into the NTSC and DTVCC caption data channels. Typically this is done in real-time, through a serial connection to your MPEG encoder.

These encoders will take Line 21 caption bytes and embed them in the video elementary stream, following the EIA-708-B and ATSC standards and FCC rules, for use by downstream devices for re-insertion as Line 21 data on any NTSC out signal.

These DTV caption encoders can also process these bytes using 708 translation software and create EIA-708-B compliant data and services for the DTVCC caption data channel. Make sure yours does this as well.



Using Line 21 Data to Provide 608/708 Captions

While these translated or "derived 708" captions maintain the basic look and feel of Line 21 captions when the receiving decoder is in a default setting,

a viewer equipped with a 708 caption decoder will be able to over-ride these settings and change the font style, font size, color and background to any of the features required by the FCC rules

This method can be used when upconverting an NTSC signal to HD, or when bridging caption data from an NTSC source with identical HD program material for encoding to an ATSC transport stream.

"Data bridging" must be done carefully to correct for latencies in related encoding or decoding cycles, and assumes that the program content and caption content of the two sources remain identical

Putting It In The VANC

Recently, a method has been developed to encode caption and other data in native HD tape formats, and for distribution and switching through HD-SDI (292) plants

Using the vertical ancillary (VANC) data space according to SMPTE-334M, product is now on the market to support this feature. Both Panasonic and Sony demonstrated HD-D5 and HDCam decks with VANC data record capability at NAB in April 2002.

Norpak, Evertz, and other manufacturers are now providing equipment to bridge caption data in and out of the VANC. These will extend the development of DTV captioning by providing Caption Distribution Packets (CDPs) as defined in EIA-708B, including NTSC caption data, DTVCC caption data and caption service information in a single wrapper.

At the end of the chain, one of these devices hands the data off to an MPEG encoder, as described above.

Getting It From The Network

Manufacturers of professional ATSC decoders and IRDs have also begun to support VANC and caption data to extend support throughout the distribution chain.

Caption data is processed from the source and re-inserted in the appropriate VANC or Line 21 form in each of the HD-SDI, SDI or NTSC component or composite outputs. Data support using AES-3 audio links has also been considered

While these products are just coming to market, they will be critical to support caption and other data needs through the broadcast facility.

Storing It and Getting It Back

Server technology is another important step in the process, and caption data need to be preserved through ingest, storage and playout. Numerous vendors have solutions to preserve Line 21 caption data in separate file structures, and these need to be extended to preserve-708-B data as well.

Getting The Captions Made Today

For programmers and producers, these solutions provide opportunities to extend caption services to digital programming today.

Using existing caption authoring systems, caption services can be created for NTSC analog and both SD and HD digital broadcasts.

Typically, network DTV submission requirements will include a captioned NTSC master as well as an HD (or SD widescreen) master. A caption agency can use an NTSC letterboxed dub of the DTV master to create a standard caption file to be encoded through any of the methods described above

Depending on the network requirement and the technology available, the caption file can be encoded onto tape or data-bridged at the network operations center or the local facility. The same caption file can be used for NTSC broadcasts and for both 608 and 708 data channels in DTV broadcasts.

If both the 608 and 708 caption data channels are used, all of the intended outcomes of the new standards and rules can be met.

The DTV broadcast will simultaneously support all legacy NTSC devices downstream, and will provide those viewers with advanced DTV caption decoders an enhanced experience and the ability to change the font style, font size, character and background color to their own preference.

How Does A DTV Receiver Find The Captions?

After going through all of this to put captions in your DTV air signal, you probably want to make sure the DTV receiver knows they're there.

The ATSC's Program and System

Information Protocol (PSIP, ATSC A/65)

provides program metadata to help a DTV

receive "name, number and navigate" the content of a DTV signal.

Early receivers didn't handle PSIP particularly well, if at all. So they typically didn't know about anything deeper than high-level (major/minor) channel information and a PID list from the service_location descriptor in the Virtual Channel Table.

New receivers are starting to get more PSIP aware, and are beginning to look deeper for PSIP data

In fact, many new receivers will look for the "caption_service descriptor", a descriptor loop that identifies each of the caption services present in a video elementary stream.

The caption_service descriptor lists each instance of captions, and whether it is a Line 21 or DTVCC service, its language, and its format. It used by the receiver to "name, number and navigate" the caption services, and to present to the viewer the choice of services in a given program

```
caption_service_descriptor
{
    descriptor_tag = 134 (0x86)
    descriptor_length = 35 bytes
    number_of_services = 4

    language_code = eng
    cc_type = 0
    line21_field = 0
    easy_reader = 0 (not tailored to the needs of beginning readers)
    wide_aspect_ratio = 0 (formatted for 4:3 aspect ratio)

    language_code = spa
    cc_type = 0
    line21_field = 1
    easy_reader = 0 (not tailored to the needs of beginning readers)
    wide_aspect_ratio = 0 (formatted for 4:3 aspect ratio)

    language_code = eng
    cc_type = 1
    caption_service_number = 1
    easy_reader = 0 (not tailored to the needs of beginning readers)
    wide_aspect_ratio = 0 (formatted for 4:3 aspect ratio)

    language_code = spa
    cc_type = 1
    caption_service_number = 2
    easy_reader = 0 (not tailored to the needs of beginning readers)
    wide_aspect_ratio = 0 (formatted for 4:3 aspect ratio)
```

Sample Caption Service Descriptor Loop

In fact, some receivers will not go any further than the descriptor, and if it's not there, will ignore any caption data and give the viewer an on-screen prompt saying "This feature is not currently available".

So you should make sure you have a "caption_service descriptor" present for each program that has captions, or you run the risk of them never getting to the screen

For a terrestrial broadcast signal, the caption_service descriptor must be located in the Event Information Table (EIT), and is optional in the Program Map Table (PMT).

As luck and politics would have it, the requirements for cable use of PSIP are exactly the opposite, mandatory in the PMT and optional in the EIT.

Table 6.16 List of Descriptors for PSIP Tables.

Descriptor Name	Descriptor tag	Terrestrial				Cable			
		PMT	MGT	VCT	EIT	PMT	MGT	VCT	EIT
stuffing_descriptor	0x80	*	*	*	*	*	*	*	*
AC-3_audio_descriptor	0x81	M			M	M			O
caption_service_descriptor	0x86	O			M	M			O
content_advisory_descriptor	0x87	O			M	M			O
extended_channel_name_descriptor	0xA0			M				M	
service_location_descriptor	0xA1			M				M	
time-shifted_service_descriptor	0xA2			M				M	
component_name_descriptor	0xA3	M				M			
user_private	0x00-0x7F	*	*	*	*	*	*	*	*

ATSC A/65 PSIP Standard

So if you're thinking that your DTV signal may be received both over-the-air and through a cable plant, you should make sure you have appropriate caption_service descriptors in both the PMT and the EIT

Check with your MPEG encoder/mux and PSIP manufacturers to make sure these functions are available in your system.

Developing Advanced Caption Authoring

DTV captioning technology is developing along with the DTV industry.

Now that DTV caption decoders are coming to market and caption services are starting to be provided on DTV programming, solutions will be developed to provide advanced authoring capabilities.

Using the full feature set of EIA-708-B, a program producer and a caption agency could develop a "caption style sheet" to create a distinctive look and feel of captions to match a program's production values.

Color and fonts could be used (judiciously) to highlight words or phrases for emphasis and educational uses.

Using the additional data capacity of the DTV Caption Data Channel, simultaneous multilingual caption or subtitle tracks - like those on a DVD - can be delivered more readily.

Efforts are underway at WGBH's Media Access Group, other caption agencies and within industry standards organizations to develop the tools to support these services in the professional broadcast environment.

Initial proposals include a universal file format for delivery of caption data to a caption encoder, to

support multiple streams of caption data for multiple platforms.

This 'bit bucket' approach would allow a flexible and extensible approach to deliver 608, 708 and other caption data streams within a single wrapper

It is expected that new caption authoring workstations will extend current capabilities and use computer-based, file transfer technologies and WYSIWYG user interfaces

Using the "caption style sheet" approach, content can be captioned by capturing text and timecode, and applying the attributes needed to render 608, 708 or other caption streams.

Related Industry Efforts

CEA closed captioning activities are conducted within the R4 3 WG1

ATSC closed captioning activities are conducted within the IS Closed Captioning Working Group.

References:

ATSC Standards
<http //www atsc org/standards html>

EIA/CEA Standards
<http //www global.ihs.com/>

SMPTE Standards
<http //www.smpte.org/smpte_store/standards

Caption Encoder Manufacturers:
EEG -<http //www.eegent.com>
Evertz - <http //www evertz.com>
Norpak - <http //www norpak.ca>
Ultech - <http //www ultechvideo com>

FCC Captioning Information
<http //www fcc gov/cgb/dro/caption html>

DTV Access Project
<http //www dtvaccess.org>

For More Information Contact:

Gerry Field, Manager
DTV Access Project
CPB/WGBH National Center for Accessible Media
125 Western Avenue
Boston, MA 02134
<gerry field@wgbh org>
(617) 300-3496

About NCAM
NCAM, The Caption Center and Descriptive Video Service® make up the Media Access Group at WGBH. Boston's public broadcaster, WGBH pioneered captioning and video description on television, the Web and in movie theaters. As the Media Access Group's research and development arm, NCAM works with industry groups including SMPTE, the ATSC and the CEA to develop and implement open technical standards for multimedia, advanced television, and convergent media that ease implementation, foster growth and lay common groundwork for equal access to new technologies. For more information, visit the Media Access Group's website at <http //access wgbh org>.

Funding Support
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Media Access Group at

DTV Access Project
www.dtvaccess.org

Making It Work:
Captioning, Audio Services & PSIP

CPB/WGBH National Center for Accessible Media
(NCAM)

Gerry Field
Manager, DTV Access Project

Media Access Group at

DTV Access Project
www.dtvaccess.org

DTV Access Project
Scope and Activities

- Closed Captioning & Video Description
- Standards Development and Implementation
  ATSC, CEA, SMPTE, SCTE, W3C
- Support to PBS Member Stations
- Support to Industry At Large

NIDRR

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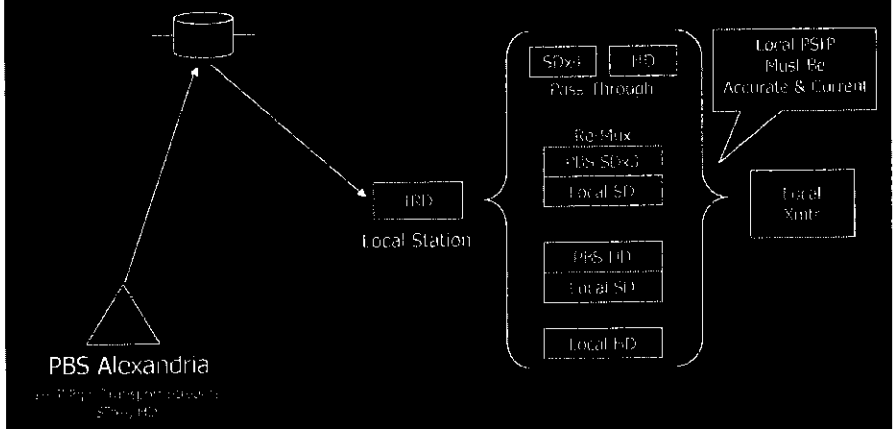
PBS Member Station
Common Distribution Model



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PSIP
Captions & Video Description

Captions

Payload

EIA-708B = 608 + 708 Data

Within Video Elementary Stream
User Data

Service Info

Caption Service Descriptor

Video Description

Payload

Dolby Digital (AC-3)

Additional audio elementary stream

Service Info

Service_Location Descriptor
AC-3 Audio Descriptor

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www.dtvaccess.org

PSIP: ATSC A/65B (March 18, 2003)

Table 6.25a List and Location of PSIP Descriptors

Descriptor Name	Descriptor Tag	Terrestrial Broadcast					
		PMT	MGT	VCT	EIT	DCCT	DCCSCT
stuffing descriptor	0x80		-	-		-	-
AC-3 audio descriptor	0x81	M			M		
caption service descriptor	0x86	O			M		
content advisory descriptor	0x87	O			M		
program identifier descriptor	0xnn	O			M		
extended channel name descriptor	0xA0			M			
service location descriptor	0xA1			S			
time-shifted service descriptor	0xA2			M			
component name descriptor	0xA3	M					
DCC departing request descriptor	0xA8					M	
DCC arriving request descriptor	0xA9					M	
redistribution control descriptor	0xAA	M			M		

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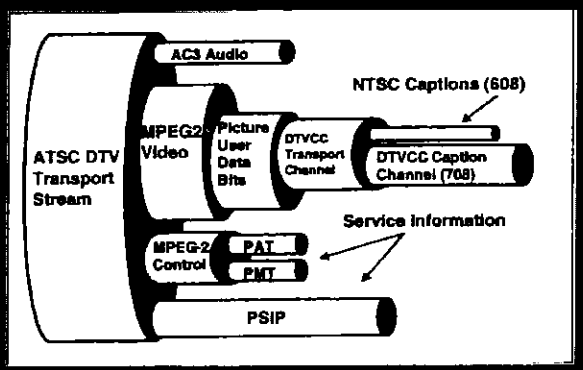
DTV Caption Pipe



Reference Documents

EIA-708B
Digital Television (DTV) Closed Captioning
December 1999

CEA CEB-10A
EIA-708B Implementation Guidance
December 2002

CEA CEB-8
Consideration of Line 21 Caption Data
October 2000

Media Access Group at

DTV Access Project
www.dtvaccess.org

Table 6.26 Bit Stream Syntax for the Caption Service Descriptor

Syntax	No. of Bits	Format
caption_service_descriptor () {		
descriptor_tag	8	0x86
descriptor_length	8	uimsbf
reserved	3	'111'
number_of_services	5	uimsbf
for (i=0 ;i<number_of_services ;i++) {		
language	8*3	uimsbf
cc_type	1	bslbf
reserved	1	'1'
if (cc_type==line21) {		
reserved	5	'11111
line21_field	1	bslbf
}		
else		
caption_service_number	6	uimsbf
easy_reader	1	bslbf
wide_aspect_ratio	1	bslbf
reserved	14	11111111111111
}		
}		

ISO-639-2
(3 Character)
Language Code

Up To 16 Services
May Be Present

CC-Type
00 - Line 21 Field 1
01 - Line 21 Field 2
10 - DTVCC Data
11 - DTVCC Start

Service Number
1-6 Basic
7-16 Advanced
("0" Illegal)

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Video Description
Assign To A Separate PID

bsmod = "010"

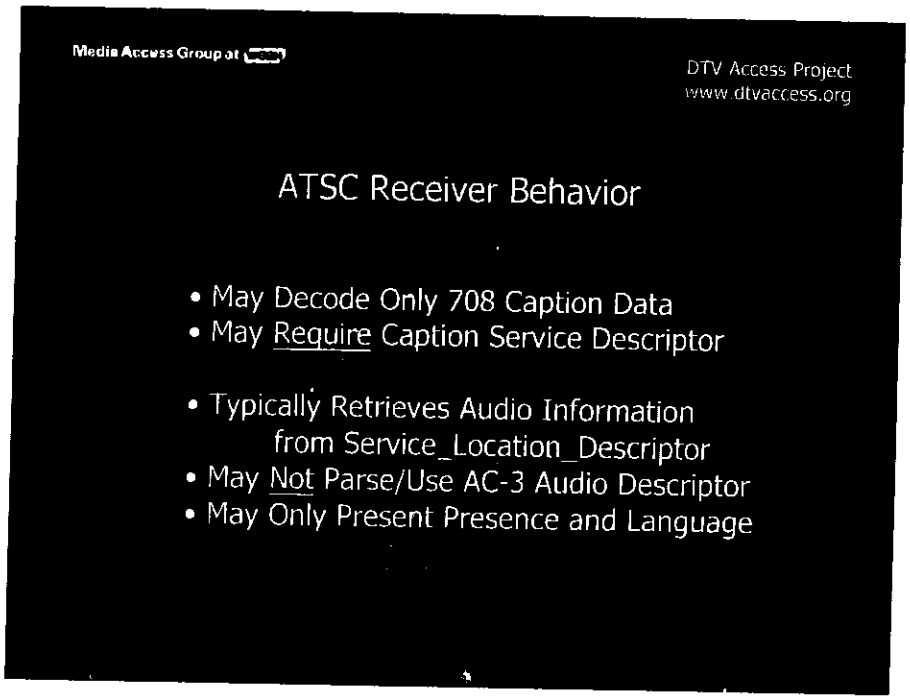
full_svc = "1"

Table 5.7 Bit Stream Mode

bsmod	acmod	Type of Service
'000	any	main audio service: complete main (CM)
001	any	main audio service: music and effects (ME)
010	any	associated service: visually impaired (VI)
011	any	associated service: hearing impaired (HI)
100'	any	associated service: dialogue (D)
101'	any	associated service: commentary (C)
110'	any	associated service: emergency (E)
111	001	associated service: voice over (VO)
111	010 - 111	main audio service: karaoke

Table A2.3 AC-3 Audio Descriptor Syntax

Syntax	No. of Bits	Mnemonic
audio_stream_descriptor () {		
descriptor_tag	8	uimsbf
descriptor_length	8	uimsbf
sample_rate_code	3	bslbf
bsid	5	bslbf
bit_rate_code	6	bslbf
surround_mode	2	bslbf
bsmod	3	bslbf
num_channels	4	bslbf
full_svc	1	bslbf
langcod	8	bslbf
if(num_channels==0) { / 1+1 mode /		
langcod2	8	bslbf
}		
if(bsmod<2) {		
mainid	3	uimsbf
reserved	5	bslbf
}		
asvcflags	8	bslbf
textlen	7	uimsbf
text_code	1	bslbf
for(i=0; i<M; i++) {		
text[i]	8	bslbf
}		
for(i=0; i<N; i++) {		
additional_info[i]	N*8	bslbf
}		
}		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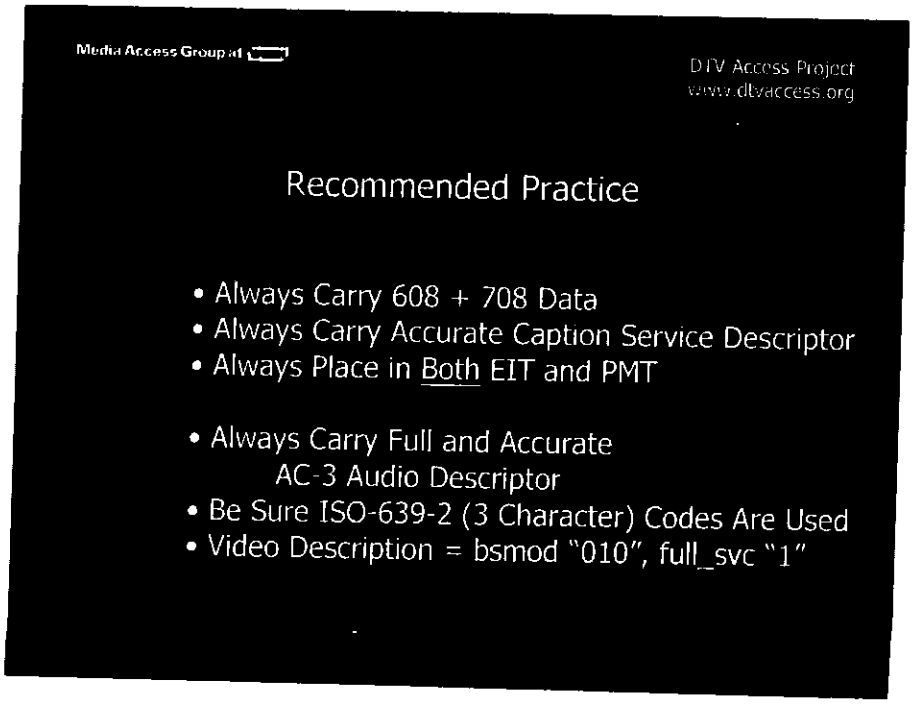
ATSC Receiver Behavior
• May Decode Only 708 Caption Data
• May Require Caption Service Descriptor
• Typically Retrieves Audio Information from Service_Location_Descriptor
• May Not Parse/Use AC-3 Audio Descriptor
• May Only Present Presence and Language


Media Access Group at
DTV Access Project
www.dtvaccess.org
Recommended Practice
• Always Carry 608 + 708 Data
• Always Carry Accurate Caption Service Descriptor
• Always Place in Both EIT and PMT
• Always Carry Full and Accurate AC-3 Audio Descriptor
• Be Sure ISO-639-2 (3 Character) Codes Are Used
• Video Description = bsmod "010", full_svc "1"

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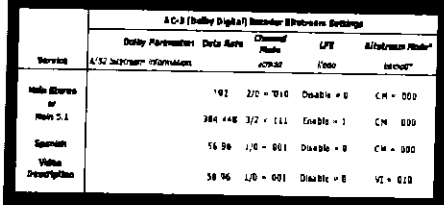
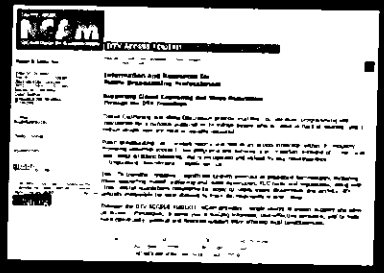
Additional Resources

ETV Cookbook
www.etvcookbook.org



DTV Access Toolkit
www.dtvaccess.org



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